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(54) Offline editing systems.

(57) A post production offline editing system is capable of storing unedited video takes in a random access memory such as a set of laser video disc players (50), displaying (52) selected takes (or individual frames from selected takes), and generating an edit list which defines an edited video programme. The system includes a computer (30) programmed with software providing an integrated software environment which enables a user conveniently to log unedited takes into the system, and to generate an edit list suitable for use in a subsequent online editing operation. The system software provides global access to a variety of video post production environments at any point during an offline editing operation. The system software presents menus to the user including icons or mnemonic text in windows (Figure 1) which may be conveniently selected by the user using a mouse (33). The system may include a video special effects unit (42) capable of processing the stored takes to simulate various video transitions between scenes (such as dissolves, fades, and wipes), to enable the user to view a show defined by an edit list which specifies such transitions. The user interface may include means for jogging (and shuttling) the laser disc players (50) using the mouse (33).

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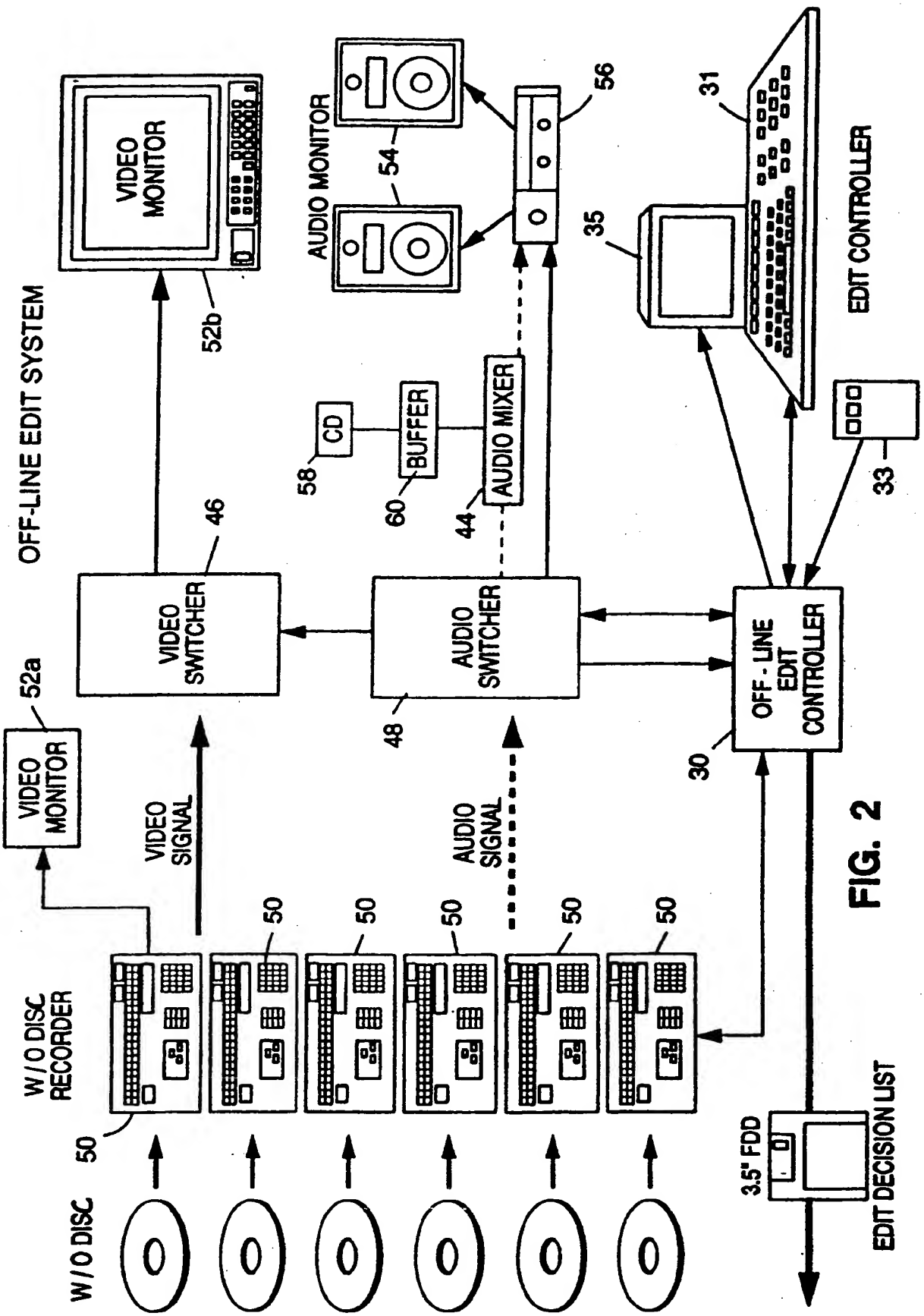


FIG. 2

OFFLINE EDITING SYSTEMS

This invention relates to offline editing systems.

Post production editing of film and video works may be efficiently accomplished using offline and online editing system. Offline editing system generate an edit list by manipulating unedited takes that have been stored in video tape or laser video disc format (e.g. motion picture film takes that have been transferred to video tape or video disc), and stored addresses (time codes) identifying the first and last frame of each take. The edit list specifies a sequence of selected takes (with transitions between the takes), which may subsequently be used by an online editing system to generate an edited master film (or tape) from the originally produced medium (e.g. motion picture film).

Post production offline editing systems have been proposed which include means for storing unedited video takes and addresses (on video tape or laser video discs), and computer means for controlling the display of selected unedited video takes (or frames of such takes) and generating the edit list in response to user-entered commands.

Throughout this specification, the noun "edit" is used (with reference to video signals) to denote one or more consecutive video frames which correspond to all or part of a scene or take. With reference to audio signals, the noun "edit" is used to denote a left or right channel of an audio sound track which corresponds to a video edit. The noun "splice" is used to denote a transition between two edits, and the noun "show" (or "video programme" or "audio programme") is used to denote a sequence of edits and splices.

A "splice" may be a simple cut, in which the end (i.e. the last frame) of a first edit is concatenated with the beginning (i.e. the first frame) of a second edit. Alternatively, a splice (whether video or audio) may be a more complicated transition, such as a wipe, fade, or dissolve. For example, a show may consist of a first edit, followed by a simple cut to a second edit, followed by a dissolve splice to a third edit. Typically, a show will include a video portion, as well as left and right channels of an audio sound track.

Sometimes, in this specification, the terms "left" and "right" edits are used respectively to denote earlier and later edits. Used in this sense, for example, when a viewer views a show in its normal time sequence (i.e. not in a reversed sequence) the viewer will see the left edit before the right edit.

Several systems have been proposed for post production offline editing. For example, US Patent No. US-A-4 796 994 (issued 24 May 1988 to Ettlinger) discloses a computer-based video editing system in which unedited takes are stored on video tape recorders (and includes a very general suggestion that video disc players may be substituted for the video tape recorders). A computer system enables the user to control the video tape recorders and generate an edit list. The computer system displays a sequence of menus which prompt the user to perform various editing operations (such as displaying desired frames of the unedited takes, shuttling frame-by-frame through a stored unedited take, adding edits to an edit list, and playing back the sequence of takes defined by the edit list). The user may select various ones of the editing operations by actuating a light pen.

As another example, US-A-4 754 352 (issued 28 June 1988 to Duffy) discloses a computer-based video editing system in which unedited takes are stored on video disc players. After generating an edit list, the user may command the system to splice takes electronically in accordance with the edit list and play back the edited show. By using a control console 50 with control buttons 100 to 112 and a dial 114, the user may command the system to display individual frames of the stored takes, or "roll" one or more takes (or an edited sequence of takes) in forward or reverse motion, at any of a variety of speeds.

However, use of light pens (as disclosed in US-A-4 796 994, cited above) is cumbersome and distracts the user's attention from the editing operation, and use of dials and buttons as disclosed in US-A-4 754 352 (cited above) is also cumbersome as the dials and buttons perform only a limited number of functions, necessitating use of a computer keyboard to perform other essential post production editing functions. Furthermore, until the present invention, it had not been known how to provide global access to a variety of video post production environments (i.e. computer menus for scene logging, edit list modification, replay of an edited show, and the like) at any point during a post production offline editing operation, and it had not been known how to design user interface software to accomplish this function using convenient icons which may be selected by the user using a mouse-type input device.

According to one aspect of the invention there is provided an offline editing system including :

random access storage means for storing unedited video takes, each of the takes comprising a number of frames ;

display means connected to the storage means for displaying selected frames of the stored takes ; and

a computer programmed with software for controlling the storage means, for providing a user with global access to a number of video post production environments at any time during an offline editing operation, and for generating an edit list in response to user-entered commands.

According to another aspect of the invention there

is provided an offline editing system including :

random access storage means for storing unedited video takes, each of the takes comprising a number of frames ;

display means connected to the storage means for displaying selected frames of the stored takes ;

a programmed computer means for controlling the storage means and for generating an edit list in response to user-entered commands, the computer means including a user interface and a set of application modules ;

a mouse connected to the computer means for entering commands to the computer means ; and

a computer monitor having a screen ;

wherein the computer means includes means for displaying windows on the screen, each of the windows including an icon or mnemonic text which corresponds to one of the modules, and wherein the computer means includes means for enabling a user to select any one of the windows by using the mouse to access the corresponding module.

According to a further aspect of the invention there is provided a post production offline editing system which includes means for storing unedited video takes in a random access memory (preferably a set of laser video disc players), displaying selected takes (or individual frames from selected takes), and generating an edit list which defines an edited video programme. Such system includes a computer programmed with software providing an integrated software environment which enables a user conveniently to log unedited takes into the system, and to generate an edit list suitable for use in a subsequent online editing operation. The system software provides global access to a variety of video post production environments (i.e. computer menus prompting the user to perform a variety of operations, such as logging of unedited takes onto the system, edit list modification, and playback of an edited show) at any point during an offline editing operation. The system software presents menus to the user including icons (and mnemonic text) within windows which may conveniently be selected by the user using a mouse.

The system components are preferably arranged so that a user may conveniently view a set of video monitors, thus focusing his or her attention on the video frames being displayed on the monitors, while manipulating the mouse to enter edit decisions into the system.

A preferred embodiment of the invention described below includes a video special effects unit capable of processing the stored takes to simulate various video transitions between scenes (such as dissolves, fades, and wipes) to enable the user to view a show defined by an edit list which specifies such transitions.

The preferred embodiment also includes a user interface that in turn includes a convenient means for jogging (and shuttling) the laser disc players using a mouse. After selecting a special jog-shuttle window (identified by an icon or mnemonic text), the user actuates certain buttons on the mouse to enter a mode in which rightward motion of the mouse commands the appropriate video disc player to shuttle a disc player in a forward direction, and leftward motion of the mouse commands the video disc player to shuttle in the reverse direction.

The preferred embodiment, in summary, is a post production editing system which includes means for storing unedited video takes in a random access memory, displaying selected takes (or individual frames from selected takes), and generating an edit list which defines an edited video program. The unedited video takes are stored in a random access memory in the form of one or more laser video discs, and the system includes a computer programmed to display menus prompting a user to perform desired editing operations.

The invention will now be further described, by way of illustrative and non-limiting example, with reference to the accompanying drawings, in which :

Figure 1 is a schematic diagram representing steps performed during post production offline editing ;

Figure 2 is a schematic diagram of an offline editing system according to a preferred embodiment of the invention ;

Figure 3 is a block diagram of a portion of the system, showing hardware connections for control signals ;

Figure 4 is a block diagram of a portion of the system, showing hardware connections for video signals ;

Figure 5 is a block diagram of a portion of the system, showing hardware connections for audio signals ;

Figure 6 is a front view of a console portion of the system ;

Figure 7 is a front view of an equipment rack portion of the system ;

Figure 8 is a diagram representing the functionality of software of the system ;

Figure 9 is a typical display produced by a user interface of the system on a computer monitor of the system ;

Figure 10 shows a display provided on the computer monitor, which includes an enlarged view of an icon shown in Figure 9 and a non-enlarged view of the icon ;

Figure 11 shows an icon of a type shown in simplified form in Figure 9 ;

Figure 12 shows a display provided on the computer monitor by a project selection module of the system ; and

Figure 13 shows a display provided on the com-

puter monitor by a scene tracker module of the system.

Figure 1 is a schematic diagram representing steps performed during post production offline editing. Figure 1 contemplates that, during production, a production crew has prepared five video tapes (or strips of motion picture film) each representing a take. Each take corresponds to a portion of a script. The takes are sometimes collectively referred to as "dailies", and are the raw material for the post-production editing process.

Each tape (or segment of motion picture film) is transferred to a laser video disc (or discs), so that the discs may be inserted into video disc playback units of an offline editing system according to a preferred embodiment of the invention. During offline editing, the editor may generate an edit list which characterises the typical "first-cut" shown in the upper right corner of Figure 1. This first cut consists of concatenated portions of each of the five takes, which define an edited show.

More specifically, during offline editing the editor identifies a group "A" of frames from a first disc as the first "edit" on the list. The editor then identifies a group "B" of frames from the first disc as the second edit, a group "C" of frames from a second disc as the third edit, a group "D" of frames from a third disc as the fourth edit, a group "E" of frames from a fourth disc as the fifth edit, a group "F" of frames from the fourth disc as the sixth edit, a group "G" of frames from a fifth disc as the seventh edit, and a group "H" of frames from the fifth disc as the eighth edit.

Of course, the editor may choose to revise the initial edit list. For example, the editor may decide that the first splice (the transition between the last frame of the edit "A" and the first frame of the edit "B") should be a wipe (or a dissolve), rather than a simple cut. The editor would accordingly supplement the edit list to include this "splice" information.

A preferred embodiment, which will now be described with reference to Figures 2 to 7, includes a programmed computer (edit controller) 30 (including offline editing control hardware and software) for generating the edit list in the form of a computer file (so that the edit list may be written by the computer 30, for example, on a 3.5 inch floppy diskette, as indicated in Figure 2).

A user interfaces with the computer 30 using a computer monitor 35, a mouse 33, and a computer keyboard 31. The computer 30 controls up to six laser video disc units 50, with each of units 50 preferably including a means (video disc player) 50b (shown in Figures 4 and 5) for playing a laser video disc (on which unedited takes may be stored) and a means (video disc recorder) 50a (also shown in Figures 4 and 5) for writing once on a laser disc (for example, to record selected takes being played by other ones of the units 50). Sony LVR-5000 and LVS-5000 video disc units are suitable for use as the means 50b and 50a, respectively.

Video signals outputted from the units 50 are routed to one or more video monitors 52a and, through a video switcher 46 operating under the control of the programmed computer 30, to one or more video monitors 52b. Only one monitor 52a and one monitor 52b is shown in Figure 2 for simplicity, but a total of eight video monitors (52a, 52b, 52c, and 52d) may be provided as shown in Figure 4. A Sony BVS-V1212 video routing switcher is suitable for use as the switcher 46.

Audio signals outputted from the units 50 (typically a left and right audio channel for each unit 50) are routed through an audio switcher 48, operating under the control of the programmed computer 30, to a stereo audio amplifier 56 and speakers 54. An additional audio signal (for special effects) is outputted from an audio compact disc (CD) player 58, through a buffer 60, to an audio mixer (mixing unit) 44, in which it may be mixed with desired signals from the audio switcher 48 before amplification in the amplifier 56. A Sony BVS-A1201 audio routing switcher is suitable for use as the switcher 48.

With reference to Figure 3, the programmed computer 30 communicates with a video special effects unit 42 (which includes a video signal generator 40), the audio mixer 44, the switchers 46 and 48, and the video disc units 50, through "quad port" boards 32, 34 and 36 and a breakout circuit (box) 38. The unit 42 is not shown in Figure 2 for simplicity.

Preferably, the computer 30 is an IBM AT personal computer (or a compatible "AT" computer), and each of the boards 32, 34 and 36 is connected within a standard IBM AT slot of the computer. Circuits on the boards 32, 34 and 36 and the circuit 38 function to enable the computer 30 to control up to twelve peripheral devices through three unmodified slots of the computer. The circuit 38 includes twelve 9-pin RS-422 ports, for connection to the twelve peripheral devices shown in Figure 3. Four such RS-422 ports are connected to each of three 37-pin ports of the circuit 38, and each such 37-pin port is connected to a 37-pin port of a respective one of the boards 32, 34 and 36.

A frame reference signal from the video signal generator 40 (which may be a Sony Model BVS-3200 signal generator) will cause an interrupt to the computer 30 through the quad port board 32, to synchronise communication for device control to video frame time.

The video special effects unit 42 (which may be a Sony DME-450 digital multi effects device) should be capable of processing the stored takes to simulate various video signal transitions between edits (such as dissolves, fades, and wipes), to enable the user to view shows defined by edit lists which specify such video signal transitions.

Similarly, the audio mixer 44 (which may be a Sony VSP-A600 audio mixing device or unit) should be capable of generating audio signal transitions such as audio cross-fades, to enable the user to listen to the audio track of shows defined by edit lists which specify such audio transitions.

A video playback output of each of the three video disc units 50 shown uppermost in Figure 4 is connected to a different video monitor within a group 52a of video monitors, and the playback output of each of the lower three video disc units 50 is connected to a different video monitor within a group 52c of video monitors. The playback output of each video disc unit 50 is also connected to an input of the video switcher 46. An output of the switcher 46 is also connected to the video disc recorder (recording unit) 50a within the top unit 50, so that the video output of the switcher 46 may be recorded on a disc within the recorder 50a. One or more of the other units 50 may also include a recorder (recording unit), connected to the switcher 46 in the same way as is the top unit 50.

Two outputs of the switcher 46 are connected to inputs of the video special effects unit 42, whose output is connected to the video monitor 52d and to an input of the switcher 46. Another output of the switcher 46 is connected to the video monitor 52b.

An audio playback output (including a left and a right audio channel) of each of the three video disc units 50 shown uppermost in Figure 5 is connected to an input of the audio switcher 48. A line output of the audio mixer 44 is also connected to left and right inputs of the recorder 50a within the top unit 50, so that the audio output of the mixer 44 may be recorded on a disc within the unit 50a.

The output of the audio CD player 58 is supplied through the buffer 60 to left and right inputs of the mixer 44, so that such audio signals may be mixed with audio signals from the switcher 48. The left and right outputs of the mixer 44 are connected to the audio amplifier 56, and the amplified left and right audio channels are sent to the pair of speakers 54.

Preferably, the video monitors 52a, 52b, 52c and 52d, the computer monitor 35, the speakers 54, the audio amplifier 56, the CD player 58, the computer keyboard 31, and the mouse 33 are mounted on a console rack as shown in Figure 6. With the arrangement of Figure 6, a user may conveniently view the video monitors (and thus focus his or her attention on the frames being displayed) while manipulating the mouse 33 in order to enter edit decisions into the system. At other times during the editing process, a user may conveniently view the computer monitor 35 while typing computer commands using the keyboard 31 or entering computer commands using the mouse 33.

Preferably also, six video disc units 50 (each including a laser video disc recorder 50a and a player 50b), the programmed computer 30, the breakout box 38, the video special effects unit 42, the video switcher 46, and the audio switcher 48 are mounted on an equipment rack portion as shown in Figure 7.

With reference to Figure 8, the programmed computer 30 includes : hardware driver software for controlling the video and audio peripheral devices of the system (including device control routines for each type of peripheral device employed in the system) ; scene tracker software (enabling the user conveniently to log unedited takes into the system, and generate lists of logged takes) ; edit decision software ; and user interface software which is capable of accessing the other system software in response to commands entered by the user using the mouse 33 or the keyboard 31 and is capable of generating displays of the type shown in Figure 9 on the screen of the computer monitor 35.

The scene tracker software (also referred to herein as the scene tracker module) enables the user conveniently to log unedited takes into the system in either of two ways (depending on whether the unedited takes are stored on video tape or on video discs). First, if the user starts with video tape versions of the unedited takes, the scene tracker module allows the user to cue individual videotaped takes (when video tape players have been connected to the system to play back the takes), mark "in" and "out" frames of the takes being played back, and copy the marked takes onto a video disc (storing not only the first and last frame time codes of the original videotaped version of each copied take, but also the first and last frame time codes of the new video disc version of each copied take). Alternatively, when the user starts with video disc versions of the unedited takes, the scene tracker module prompts the user to mark "in" and "out" frames of desired ones of the takes, and stores the "in" and "out" (first and last) frame time codes of each marked take (i.e. the scene tracker module logs the marked takes).

The scene tracker module also prompts the user to enter descriptions of logged takes (using the computer keyboard 31), and stores the user-entered descriptions. Additionally, the scene tracker module allows the user to revise the descriptions of the logged takes, and to add or delete selected takes to a scene tracker data base (which data base includes the addresses and descriptions of the logged takes).

The edit decision software includes a "first cut" module, a "sync-roll" module, a "review modify" module and an "edit list manager" module, all shown in Figure 8.

The first cut module enables the user conveniently to generate an edit list from logged, unedited takes. The edit list includes time codes identifying the splices between edits on the list, codes identifying the type of each splice (i.e. wipe, dissolve, fade, or simple cut), and user-entered descriptions of the edits on the list.

The "review modify" module enables the user to

revise an already-generated edit list (while viewing selected video takes), and to view a show defined by an already-generated edit list (i.e. to cause the video tape players to simulate the show by sequentially playing back the edits on the edit list).

The sync-roll module enables the user to view simultaneously a set of synchronised takes (i.e. takes produced by a number of synchronised cameras) on a number of video monitors, while marking "in" and "out" frames of desired ones of the takes to generate an edit list.

The edit list manager module displays text prompts for prompting the user to manipulate already-generated edit lists (for example by changing the description of an edit or block of edits on the list, or by copying a sequence of edits to another location on the edit list).

Within the first cut module, and each of the other modules described with reference to Figure 8, there are user-selectable subroutines (also denoted herein as "modules") to be described below with reference to Figure 9.

The user interface software provides an integrated software environment in which the user has global access to a variety of video post production environments, including the scene tracker, first cut, sync-roll, review modify, and edit list manager modules described above. Specifically, the user interface displays user-selectable icons and mnemonic text (representing software modules) enabling the user to access desired software module (in which a full-screen or pull down menu may be displayed) at any stage during an offline editing operation. The icons (or windows including text) may be selected by the user using the mouse 33.

Figure 9 is a typical display generated by the system's user interface software on the screen of the computer monitor 35 during operation of the system. Global icons appear in the upper right area of the screen. The user may command the system to execute a software application module of the above-described software by actuating the mouse 33 to select the icon corresponding to the module. For example, the user may select an icon 120 (a graphic representation of a question mark) to execute a "help" module; an icon 121 to command the system to display the current data and time ; an icon 122 (a perspective view of a file cabinet, with drawers for containing project files) to execute a "project selection" module in which the system displays a menu including a list of previously created editing project files ; an icon 123 (a perspective view of a stack of papers with the initials "OE" on the first paper in the stack) to execute a module enabling the user to select one of the modules described above with reference to Figure 8 (and thus to reconfigure the display screen) ; an icon 124 (a perspective view of a video special effects device resembling the Sony DME-450 digital multi effects device) to execute a "special effects" module (in which the system displays a menu enabling the user to control a digital special effects device to simulate desired transitions between user-specified frames) ; and an icon 125 to access the computer's operating system.

Upon moving a displayed cursor onto an icon using the mouse 33, the icon will become highlighted (as is the icon 123 in Figure 9). The user may select a highlighted icon by "clicking" one of the buttons on the mouse 33. (Three such buttons are shown in Figure 2.)

Mnemonic text appears in windows along the top and bottom edges of the screen, such as windows 108 and 110. The user may command the system to execute an application module by actuating the mouse 33 to select the text window corresponding to the module. For example, the user may select text in the window 108 ("Advance") to command the system to add the left edit (the edit whose time codes are currently displayed in a window 150, and have been marked) to the edit list, move the right edit (the edit whose time codes are currently displayed in a window 151, and have been marked) to the left monitor 52b (and move the displayed information from the window 151 to the window 150), and move the next edit (if any) on the edit list to the right monitor 52d (and display the "in" time codes for such next edit in the window 151).

As another example, upon selection of text in the window 110 ("Preview") the system will play (display on the video monitor 52b) the last five seconds of the current left edit through to the end of the current right edit. As another example, upon selection of a "reformat" text window 133 along the top edge (immediately to the right of an "edit list manager" module window 132), the system might prompt the user to modify the position of the displayed windows and icons.

The user may cue a take in a variety of ways. For example, the user may select a video disc player and enter a desired time code (typically after accessing the scene tracker module to display a list of logged takes), and specify whether the take is to be the left or right edit. The time codes of the current left edit (for the video, left audio, and right audio channels) are displayed in the window 150 (labelled "out"). Similarly, time codes of the current right edit are displayed in the window 151 (labelled "in"). Also in response to such cueing commands, the system's hardware driver software will physically prepare the disc to play back the selected take (for example, on the left monitor 52b for a left edit, or on the right monitor 52d for a right edit, as well as on that one of the monitors 52a to 52c which corresponds to the selected disc player).

Alternatively, the user may select a video disc player and enter a project identification code (a code identifying an already-generated edit list). In this case, the system will cue the selected player to the beginning of the first edit on the identified edit list, dis-

play the time codes of this first edit in the "in" window, and display the first edit (as a right edit) on the right monitor 52d.

Alternatively, the user may enter a project identification code (a code identifying an already-generated edit list). In this case, the system will cue the nearest disc player to the beginning of the first edit on the identified edit list, display the time codes of this first edit in the "in" window, and display the first edit (as a right edit) on the right monitor 52d.

Additional application modules may be selected by choosing appropriate windows including icons or mnemonic text on the display screen, although not all such windows are shown in Figure 9, for simplicity. Additional modules allowing the user to view selected edits (or edit sequences) include :

"Replay", in which the system starts at the beginning of the left edit and plays through the rest of the edits on an edit list ;

"Restart", in which the system starts at a user-specified restart limit (time code) and plays through the rest of the edits on an edit list up to a second user-specified restart limit ;

"Restart Limits", in which the system stores user-specified restart limits (time codes) for use in performing a "Restart" operation ;

"Open", in which the system cues a pair of players at a specified splice (so that the user may view the last frame of the left edit juxtaposed with the first frame of the right edit) ; and

"Rock and Roll", in which the system enables the user to view a specified splice at any speed in a forward or reverse direction.

When a laser disc player is cued to a particular frame, a corresponding one of windows 140 to 145 will display the time code of that frame, and the project identification number (or "scene id," as denoted in Figure 9) identifying an edit list including the edit to which the frame belongs. It is contemplated that, in a variation of the embodiment of Figures 2 to 7, the monitors 52a and 52c will be deleted and replaced by a means for displaying each cued frame in a picture-in-picture video window at one of the locations of the windows 140 to 145 of the screen of the computer monitor 35. In such variation, if a frame with the SMPTE time code 00 :00 :32 is cued on a first of the video disc units 50, that frame would be displayed in the "first" picture-in-picture window (the window 140 in Figure 9).

Additional modules allowing the user to mark edits include :

"Out", in which the system marks the time code of all three of the video, left audio, and right audio channels of the currently cued left edit (i.e. the three time codes currently identified in the window 150) ;

"In", in which the system marks the time code of all three of the video, left audio, and right audio channels of the currently cued right edit (i.e. the three time codes currently identified in the window 151) ;

"Edit", in which the system performs both the "In" and "Out" functions ;

"V", "A1", "A2", "VA1", "VA2", "A1A2", in which the system marks the time code of the current left edit and the time code of the current right edit for the indicated channels (i.e. for the video channel and the left audio channel in the case of the module "VA1") ; and

"Trim", in which the system adds or subtracts a user-specified number of frames to or from specified channels on specified sides of a splice (the user may specify the left side of the splice by operating the mouse to select a Trim icon 101, the right side of the splice by operating the mouse to select a Trim icon 103, and both sides of the splice by operating the mouse to select a Trim icon 105).

Additional modules allowing the user to end processing of a splice include :

"Advance" (described above with reference to the window 108) ;

"Reset", in which the system will undo the most recent "Advance" operation) ; and

"Store", in which the system will store the current edit list on a floppy diskette (or hard disc).

Additional modules allowing the user to modify edits about a selected splice include :

"Overlay" (after selecting this module, to overlay a video or audio edit on a specified left edit, the user specifies the overlay signal source, a begin time code within the left edit, a begin time code from the overlay source, and an end time code from either the left edit or the overlay source) ;

"Insert" (after selecting this module, to add a video or audio edit to the edit list at a point within a left edit, the user specifies a target time code within the left edit, the insert signal source, a begin time code from the insert source, and an end time code from the insert source) ; and

"Delete" (after selecting this module, to delete a video or audio channel from a right edit, the user simply enters the channel to be deleted).

As mentioned above, the video special effects unit 42 is provided to process selected takes to simulate special video transitions between edits (such as dissolves, fades, and wipes). If no special transitions are specified, the edit list will designate a simple "cut" splice between each pair of edits. On the other hand, the system allows the user to identify "special effects" splices on the edit list (so that, for example, the edit list might specify that the second splice is a linear dissolve with a duration of "X" frames). The system software includes a special effects module (actuated by selecting the icon 124) enabling the user to control the unit 42, in order to view a show defined by an edit list which specifies such transitions. This special effects module will preferably include the following user-selectable modules :

"Dissolve", to command the system to simulate

a dissolve of specified type upon playback of the edited show ;

"Wipe", to command the system to simulate a wipe of specified type upon playback of the edited show ;

"Fade", to command the system to simulate a fade of specified type upon playback of the edited show ; and

"Effects", in which the system prompts the user to select effects board options.

The system is preferably operative to display a graphical representation of the current edit list in a window 106. In such representation, each splice is represented by a vertical bar (or the like), which may optionally be identified by a reference numeral. For example, in Figure 9, eight bars, identified by the numbers one to eight, are displayed in the window 106 to indicate that the current edit list includes nine takes separated by eight splices. Preferably, when frames from adjacent edits on the edit list are identified in the windows 150 and 151, the system will automatically highlight the vertical bar in the window 106 corresponding to the splice between these two edits.

Upon selection of certain windows (i.e. a first cut module window 130, a review modify module window 131, the edit list manager module window 132, and the reformat window 133), the system will display a pull down menu to prompt the user to take further action.

In certain modules, specifically defined functions are displayed in windows 112, 114, and 116. Such functions may be selected by actuating, respectively, the left button of the mouse 33, the middle button of the mouse 33, or the right button of the mouse 33. (The left, middle, and right buttons are shown on the mouse 33 in Figure 2.)

In one important example, the user may conveniently perform a laser video disc jog/shuttle function by operating the mouse 33 in the following manner. After the user has positioned the cursor onto a desired one of jog/shuttle windows 100, 102, and 104 using the mouse 33, the user may actuate the left button to cue the disc player back by one frame (to the previous frame), or the right button to cue the disc player ahead by one frame (to the next frame).

In this situation, if the user actuates the middle button, the system interprets motion of the mouse 33 in the following manner. As long as the user moves the mouse towards the left, the system will continuously cue the disc player in the reverse direction (to earlier frames). As long as the user moves the mouse towards the right, the system will continuously cue the disc player in the forward direction (to later frames). While in this "shuttle" mode, the user may exit the shuttle mode by actuating the right button, and may actuate various combinations of the left and middle buttons to command the system to change the speed or direction in which the disc player shuttles. In the shuttle mode (as in other modes), mnemonic text representing the mouse button functions will preferably be displayed in the windows 112, 114, and 116.

For example, in the shuttle mode, actuation of the middle button might command the system to increase the shuttling speed, actuation of the left button might command the system to decrease the shuttling speed, and simultaneous actuation of the left and middle buttons might command the system to reverse the direction of shuttling.

If the window 100 is selected, the jog and/or shuttle function of the "left" laser disc player (the laser disc player on which the frame identified in the window 150 is cued) is enabled. If the window 102 is selected, the jog and/or shuttle function of the "right" laser disc player (the laser disc player on which the frame identified in the window 151 is cued) is enabled. If the window 104 is selected, the jog and/or shuttle functions of both the right and left laser disc players are enabled.

Figure 10 shows two versions of the icon 122 shown in Figure 9, including an enlarged view (on the left) and a non-enlarged view (on the right). Figure 11 is a more detailed, enlarged version of the icon 124, which is shown in simplified form in Figure 9.

Figure 12 is a typical display produced on the screen of the computer monitor 35 upon selection of the project selection module, i.e. upon selection of the icon 122 shown in Figure 9. The "project folder" display of Figure 12 includes alphabetically arranged "file" icons 200 and 202. Each of the icons 200 represents a different letter of the alphabet, and the icon 202 represents all letters of the alphabet. Upon selection of any of the file icons 200 and 202 using a mouse, the system will display a pulldown menu listing all computer files having names beginning with the corresponding letter (or letters) of the alphabet. The user may then select any desired file from the list on the pulldown menu. Even without selection of one of icons 200 and 202, a list of files will appear in a window 204. By entering appropriate mouse commands, additional information regarding any of the files in the window 204 will be displayed in a window 206.

Figure 13 is a typical display produced on the screen of the computer monitor 35 upon selection of the scene tracker module. An "index card" display 300 in Figure 13 includes a window 302 for displaying a file name identifying the computer file in which the scene tracking information being entered by the user will be stored. While viewing takes (stored in videotape or laser video disc form), the scene tracker software displays (in windows 312) "in" and "out" frame time codes of the takes being viewed (i.e. time codes from the source tape or source video disc identified in a window 311), and also displays (in windows 314) in and out frame time codes of video disc locations (of the disc identified in a window 313) into which the user may choose to copy such takes. The "index card" dis-

play of Figure 13 also provides additional windows in which the user may conveniently type information describing the take identified by time codes in the windows 312 and 314. The display of Figure 13 also includes icon windows 304, 306, 308 and 310, which may be selected by the user to perform various scene logging operations. For example, selection of icon of the window 308 may instruct the system to display all information regarding another take that has previously been logged into the system (so that the user may revise previously-entered descriptive information regarding that take).

It is contemplated that the system may include random access memory units other than laser video disc players for storing the video and audio signals which comprise the unedited takes. For example, the takes may be digitised and stored in magnetic disc drives.

Claims

1. An offline editing system including :

   random access storage means (50) for storing unedited video takes, each of the takes comprising a number of frames ;

   display means (52) connected to the storage means (50) for displaying selected frames of the stored takes ; and

   a computer (30) programmed with software for controlling the storage means (50), for providing a user with global access to a number of video post production environments at any time during an offline editing operation, and for generating an edit list in response to user-entered commands.

2. A system according to claim 1, wherein the computer is programmed with software including a user interface and a set of application modules (Figure 8), each of the modules being accessible by the user through the user interface.

3. A system according to claim 2, including a mouse (33) connected to the computer (30) for entering commands to the computer and a computer monitor (35) having a screen, wherein the computer is programmed with software for displaying on the screen windows (Figure 9) each including an icon or mnemonic text which corresponds to one of the modules, and wherein the user may select any one of the windows using the mouse to access the corresponding module.

4. A system according to claim 2 or claim 3, wherein the modules include a scene tracker module for prompting the user to log selected ones of the takes and logging said selected ones of the takes in response to user commands, and a first cut module for prompting the user initially to generate the edit list and generating the edit list in response to user commands.

5. A system according to claim 4, wherein the modules include a review and modify module for prompting the user to display a sequence of takes corresponding to the edit list and for revising the edit list in response to user commands.

6. A system according to claim 5, wherein the modules include an edit list module for prompting the user to review the edit list and for revising the edit list in response to user commands.

7. A system according to claim 1, wherein : the display means (52) includes a set of video monitors; the system includes a mouse (33) connected to the computer (30) for entering commands to the computer, a keyboard (31) connected to the computer (30), and a computer monitor (35) connected to the computer ; the computer monitor (35) is mounted in a position so that a user may conveniently view the computer monitor while manipulating the mouse (33) and the keyboard (31) ; and the video monitors are mounted in positions so that the user may conveniently view frames being displayed on the video monitors while manipulating the mouse (33) to enter edit decisions into the system.

8. A system according to claim 1, wherein : the random access storage means (50) includes at least one laser video disc player ; the system includes a mouse (33) connected to the computer (30) for entering commands to the computer and a computer monitor (35) having a screen ; the computer (30) is programmed with software for displaying a window on the screen and an icon or mnemonic text in the window ; and the user may select a window to access a disc player jog/shuttle module for controlling the laser disc player.

9. A system according to claim 8, wherein the mouse (33) has a plurality of buttons, and wherein the disc player jog/shuttle module includes software for cueing the disc player back by one frame in response to actuation of a first one of the buttons, and for cueing the disc player ahead by one frame in response to actuation of a second one of the buttons.

10. A system according to claim 9, wherein the disc player jog/shuttle modules includes software for responding to actuation of a third one of the buttons by continuously jogging the disc player in a forward direction for so long as the user moves

the mouse (33) in a first direction, and continuously jogging the disc player in a reverse direction for so long as the user moves the mouse (33) in a second direction opposite to the first direction.

11. A system according to claim 10, wherein the disc player jog/shuttle module includes software for responding to actuation of various combinations of the buttons by changing the speed or direction in which the disc player is shuttled.

12. A system according to claim 8, wherein the mouse (33) includes buttons, and wherein the computer (30) is programmed with software for displaying mouse button windows on the screen and an icon or mnemonic text in each of the mouse button windows corresponding to a user-selectable module within the disc player jog/shuttle module.

13. A system according to any one of the preceding claims, including a video special effects means (42) operating under control of the programmed computer (30) to generate, for display on the display means (52), video simulations of video transitions between selected ones of the takes.

14. A system according to any one of claims 1 to 7, wherein the random access storage means (50) is a set of laser video disc players.

15. A system according to claim 14, wherein the computer (30) includes a peripheral device control slot, and a means (34, 36) for interfacing between the slot and at least two of the laser video disc players (50).

16. A system according to any one of the preceding claims, which is capable of processing takes each including a video channel and at least one audio channel.

17. A system according to claim 1, including a computer monitor (35) having a screen, the computer (30) being programmed with software for displaying a graphical representation of the edit list in a window (106) on the screen.

18. A system according to claim 17, wherein the edit list comprises edits separated by splices, and wherein the graphical representation of the edit list includes a graphical element representing each splice.

19. A system according to claim 1, wherein the edit list comprises edits separated by splices, and the system includes a video special effects means (42) operating under control of the programmed computer (30) for generating display video simulations of the splices.

20. A system according to claim 1, wherein the edit list comprises edits separated by splices, and the system includes an audio mixing unit (44) operating under control of the programmed computer (30) for generating playback audio simulations of the splices.

21. A system according to claim 1, wherein : the computer (30) is programmed with software including an application module ; the system includes a computer monitor (35) having a screen ; the computer (30) is programmed with software for displaying a window on the screen including an icon which corresponds to the module ; and the user can select the window to access the module.

22. A system according to claim 21, wherein the application module is a project selection module which when accessed causes the computer (30) to display a menu on the screen including a list of previously created editing project files, and the icon (122) is a perspective view of a file cabinet with drawers for containing project files.

23. A system according to claim 21, which includes a video special effects means (42) operating under control of the programmed computer (30), and wherein the application module is a special effects module which when accessed causes the computer (30) to display a menu on the screen enabling the user to control the digital special effects means (42), the icon (124) being a view of the video special effects device.

24. An offline editing system including :

random access storage means (50) for storing unedited video takes, each of the takes comprising a number of frames ;

display means (52) connected to the storage means (50) for displaying selected frames of the stored takes ;

a programmed computer means (30) for controlling the storage means (50) and for generating an edit list in response to user-entered commands, the computer means (30) including a user interface and a set of application modules ;

a mouse (33) connected to the computer means (30) for entering commands to the computer means ; and

a computer monitor (35) having a screen ;

wherein the computer means (30) includes means for displaying windows (Figure 9) on the screen, each of the windows including an icon or mnemonic text which corresponds to one of the modules, and wherein the computer means (30)

includes means for enabling a user to select any one of the windows by using the mouse (33) to access the corresponding module.

25. A system according to claim 24, wherein the display means (52) includes a set of video monitors mounted in positions so that a user may conveniently view frames being displayed on the video monitors while manipulating the mouse (33) to enter edit decisions into the system.

26. A system according to claim 24 or claim 25, wherein the random access storage means (50) includes at least one laser video disc player, the computer means (30) is programmed with software for displaying a disc player control window on the screen, and the user can select the disc player control window to access a disc player Jog/shuttle module for controlling the laser disc player.

27. A system according to claim 26, wherein the mouse (33) includes a plurality of buttons, and wherein the disc player jog/shuttle module includes software for cueing the disc player back by one frame in response to actuation of a first one of the buttons and for cueing the disc player ahead by one frame in response to actuation of a second one of the buttons.

28. A system according to claim 27, wherein the disc player jog/shuttle module includes software for responding to actuation of a third one of the buttons by continuously jogging the disc player in a forward direction for so long as the user moves the mouse in a first direction, and continuously jogging the disc player in a reverse direction for so long as the user moves the mouse in a second direction opposite to the first direction.

29. A system according to claim 28, wherein the disc player jog/shuttle module includes software for responding to actuation of various combinations of the buttons by changing the speed or direction in which the disc player is shuttled.

30. A system according to claim 26, wherein the mouse (33) includes buttons, and wherein the computer means (30) is programmed with software for displaying mouse button windows on the screen and an icon or mnemonic text in each of the mouse button windows corresponding to a user-selectable module within the disc player jog/shuttle module.

31. A system according to any one of claims 24 to 30, including a video special effects means (42) operating under control of the programmed computer means (30) to generate, for display on the display means (52), video simulations of video transitions between selected ones of the takes.

32. A system according to claim 24 or claim 25, wherein the random access storage means (50) is a set of laser video disc players.

33. A system according to claim 32, wherein the computer means (30) includes a peripheral device control slot, and a means (34, 36) for interfacing between the slot and at least two of the laser video disc players (50).

34. A system according to any one of claims 24 to 33, which is capable of processing takes each including a video channel and at least one audio channel.

35. A system according to any one of claims 24 to 34, wherein the computer means (30) is programmed with software for displaying a graphical representation of the edit list in a window (106) on the screen.

36. A system according to claim 35, wherein the edit list comprises edits separated by splices, and wherein the graphical representation of the edit list includes a graphical element representing each splice.

37. A system according to claim 24, wherein the edit list comprises edits separated by splices, and the system includes an audio mixing unit (44) operating under control of the programmed computer means (30) to generate for playback audio simulations of the splices.

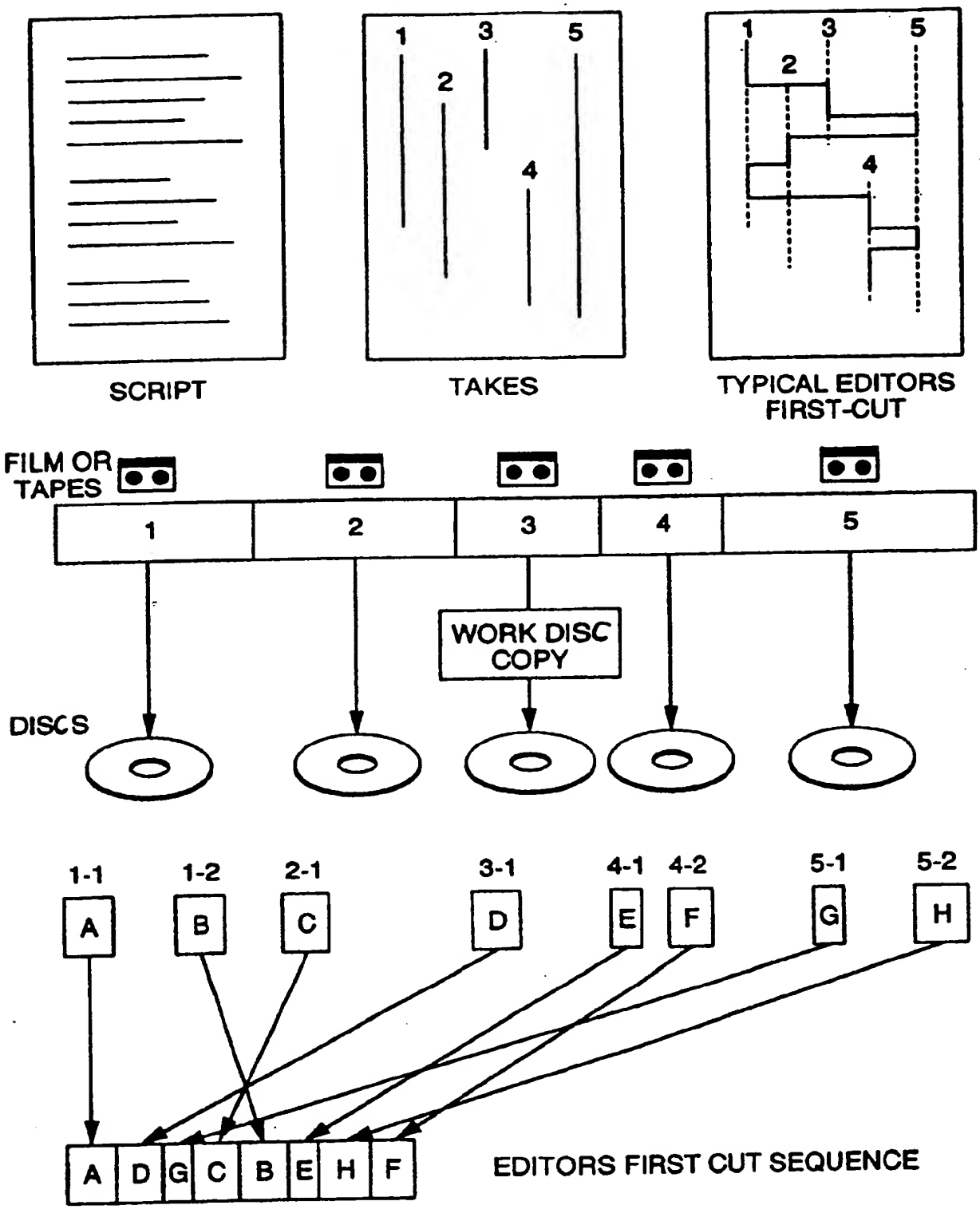


FIG. 1

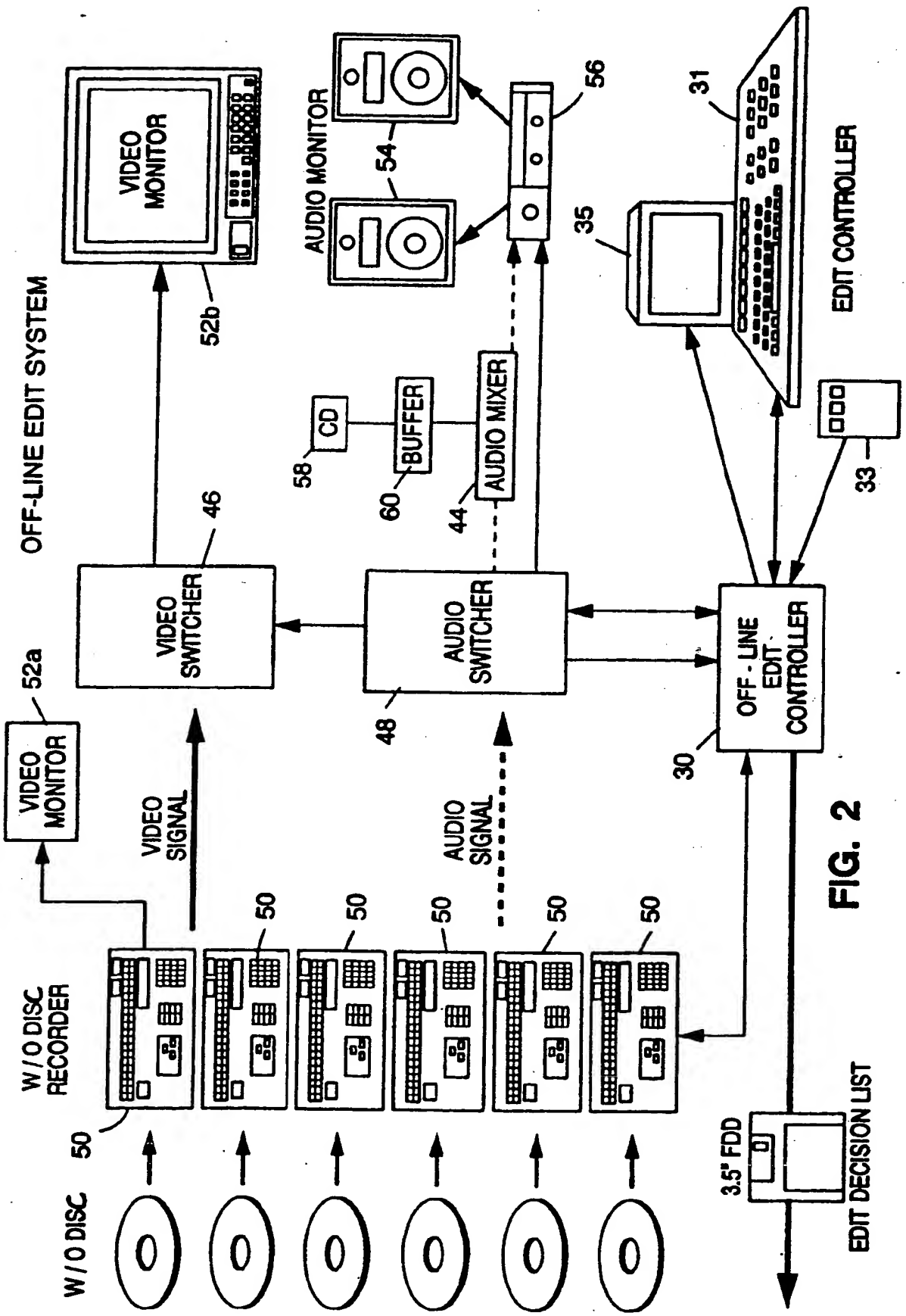


FIG. 2

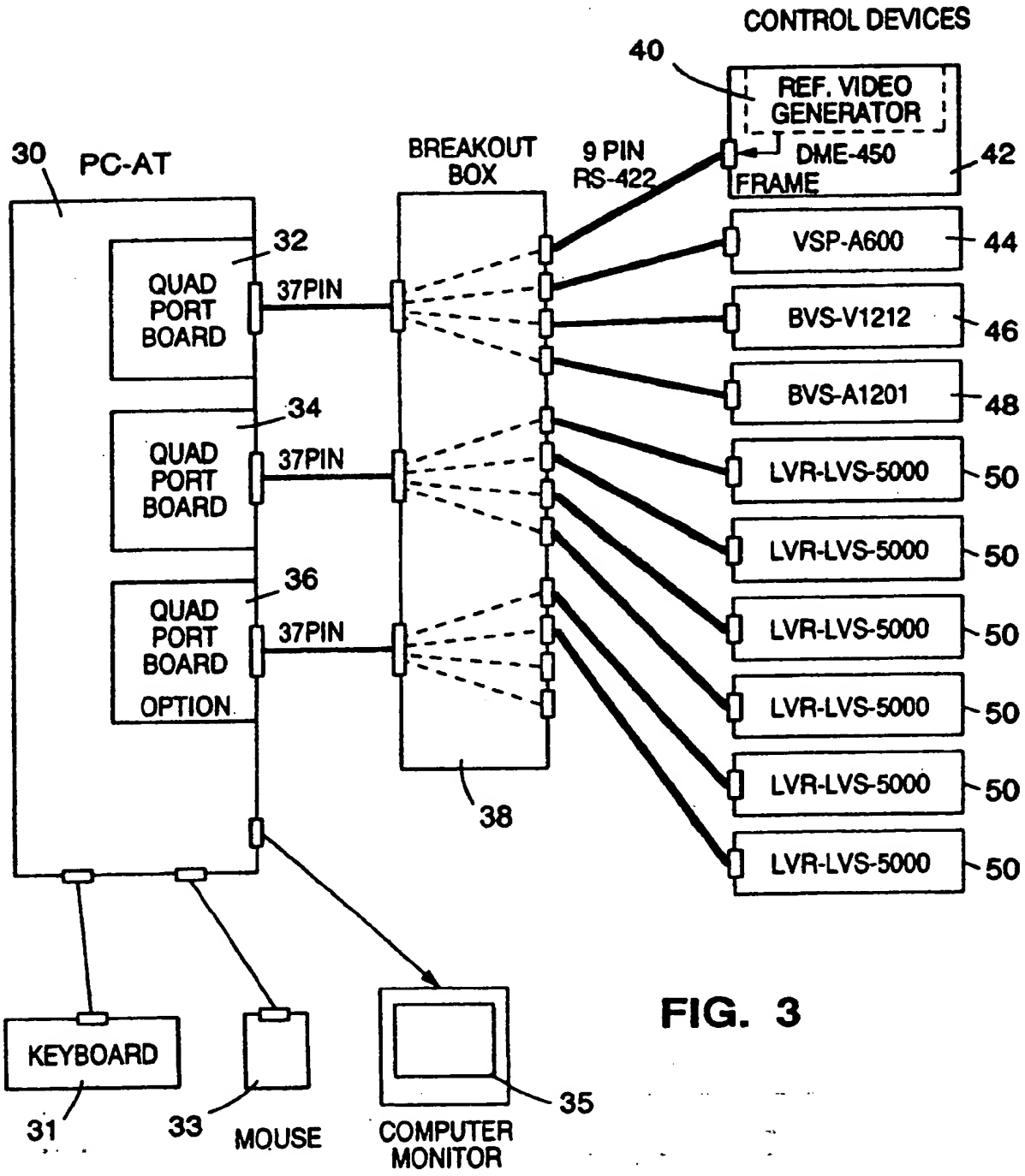
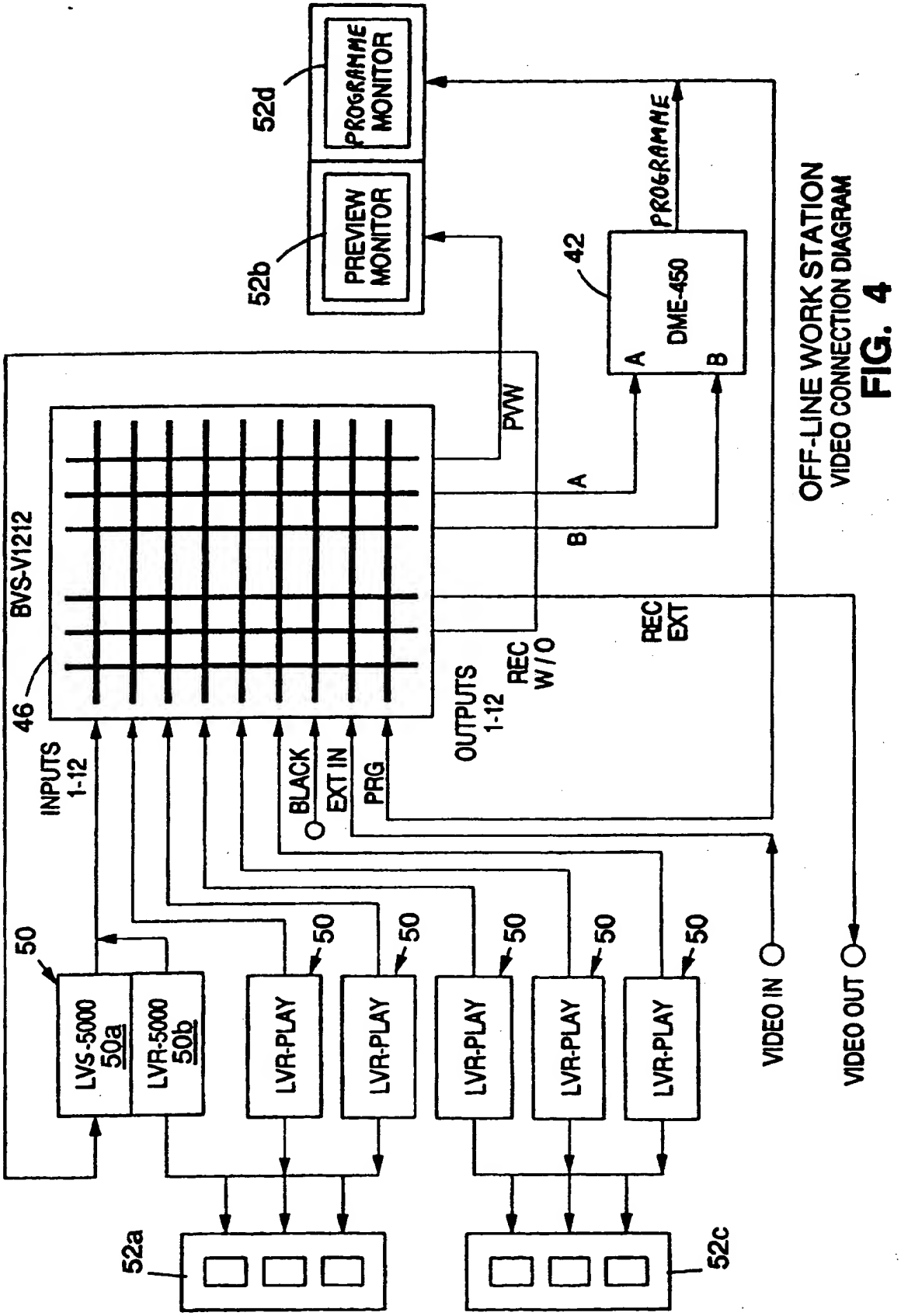


FIG. 3



OFF-LINE WORK STATION
VIDEO CONNECTION DIAGRAM

FIG. 4

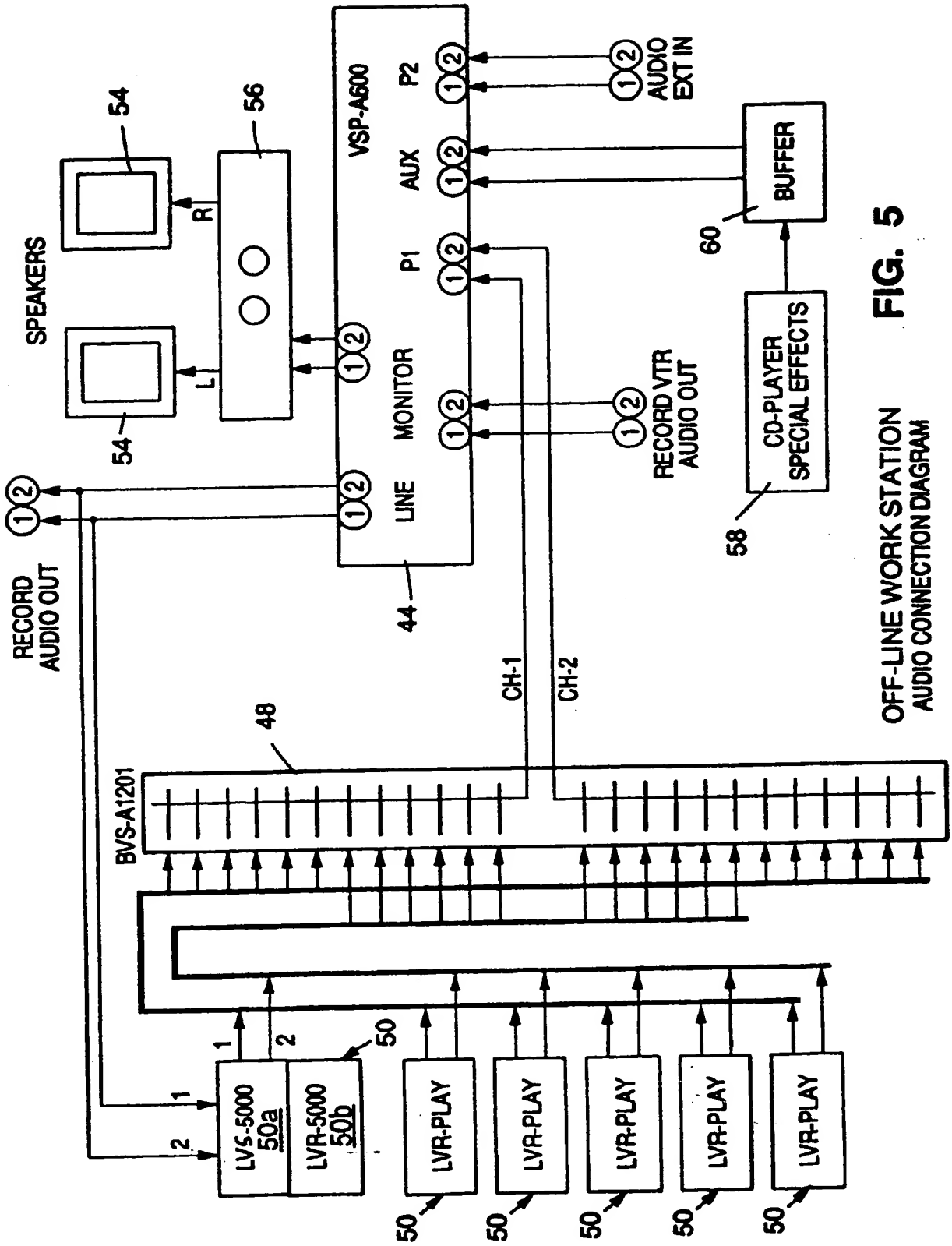


FIG. 5

OFF-LINE WORK STATION
AUDIO CONNECTION DIAGRAM

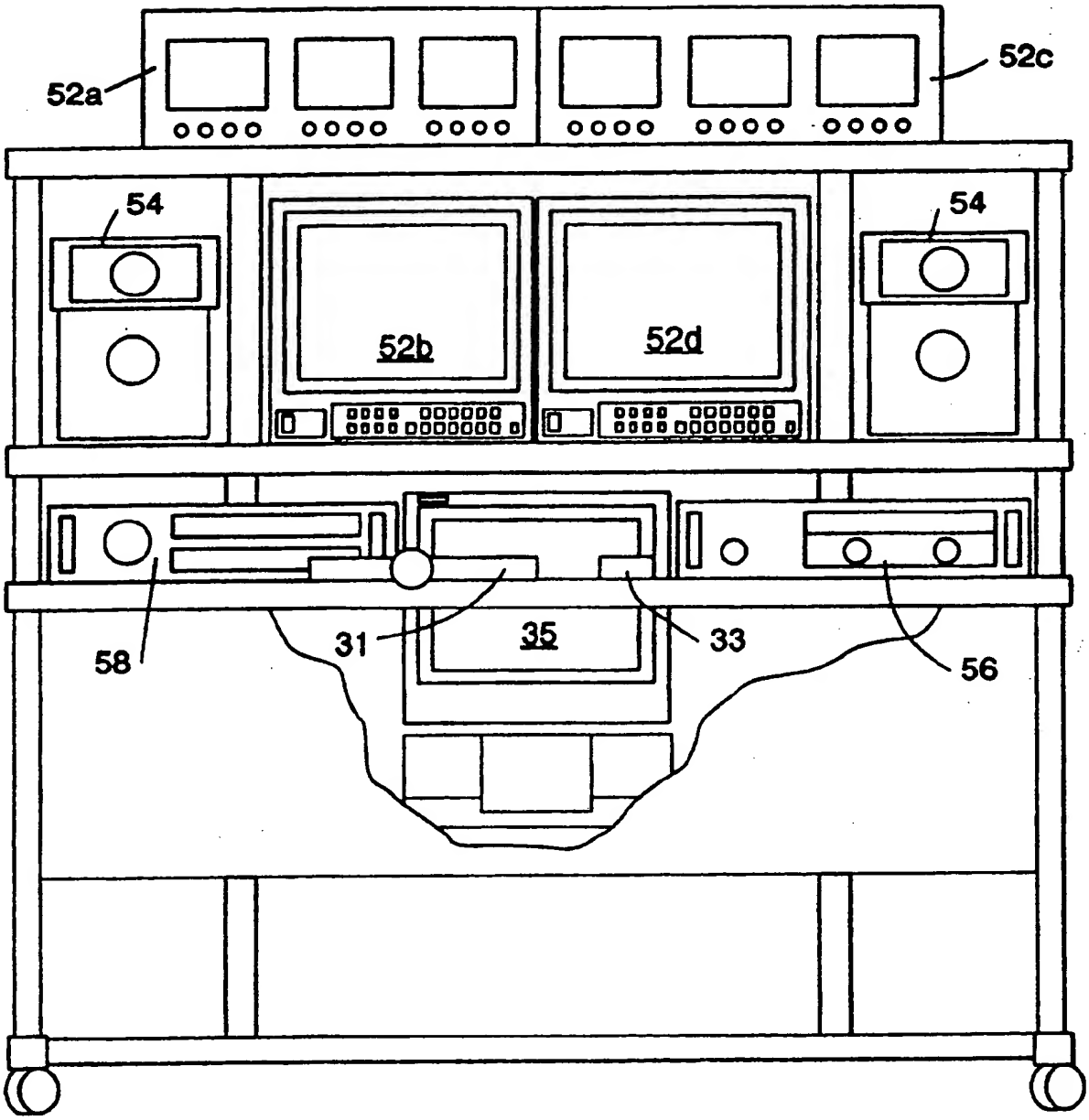


FIG. 6

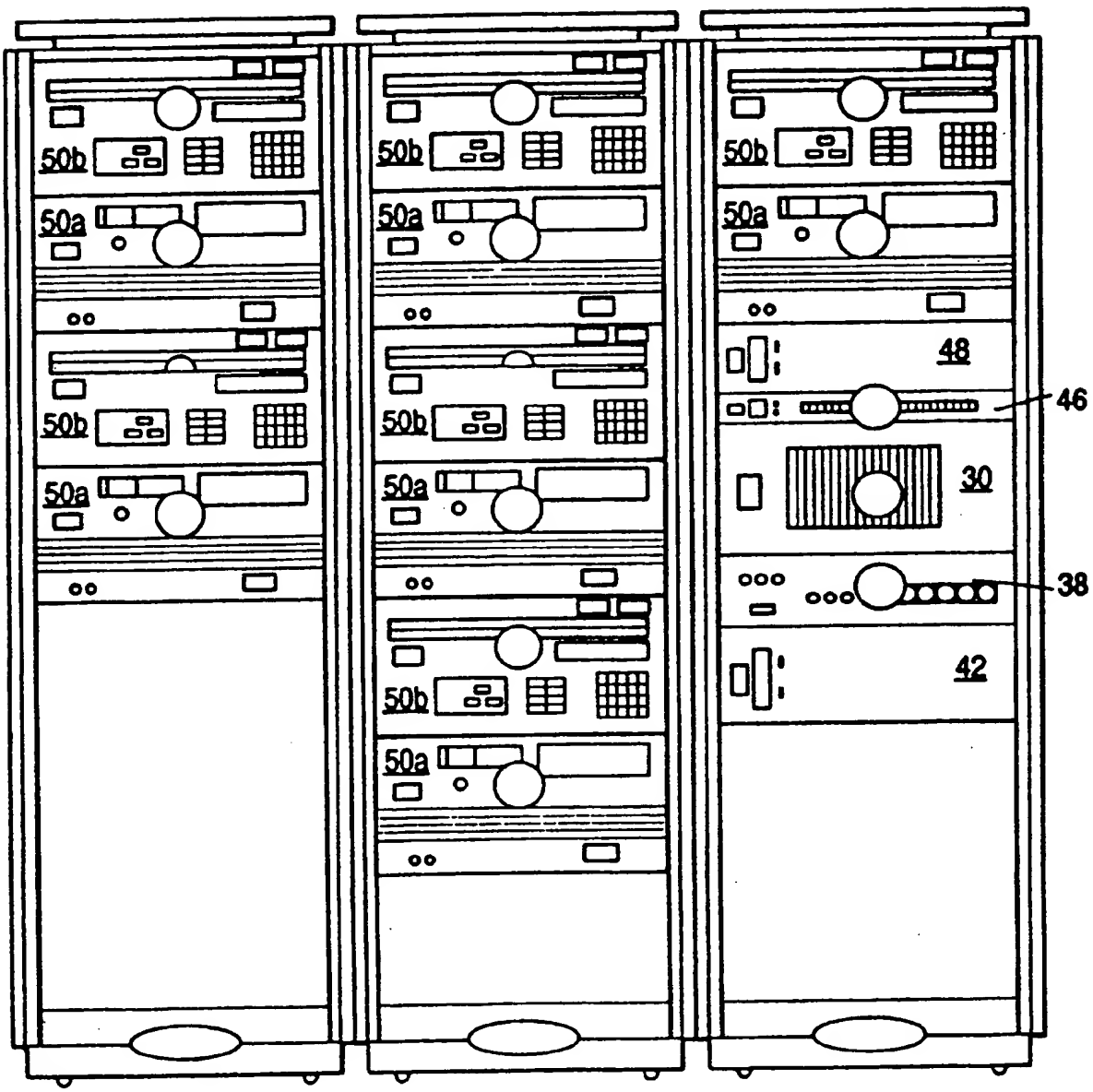


FIG. 7

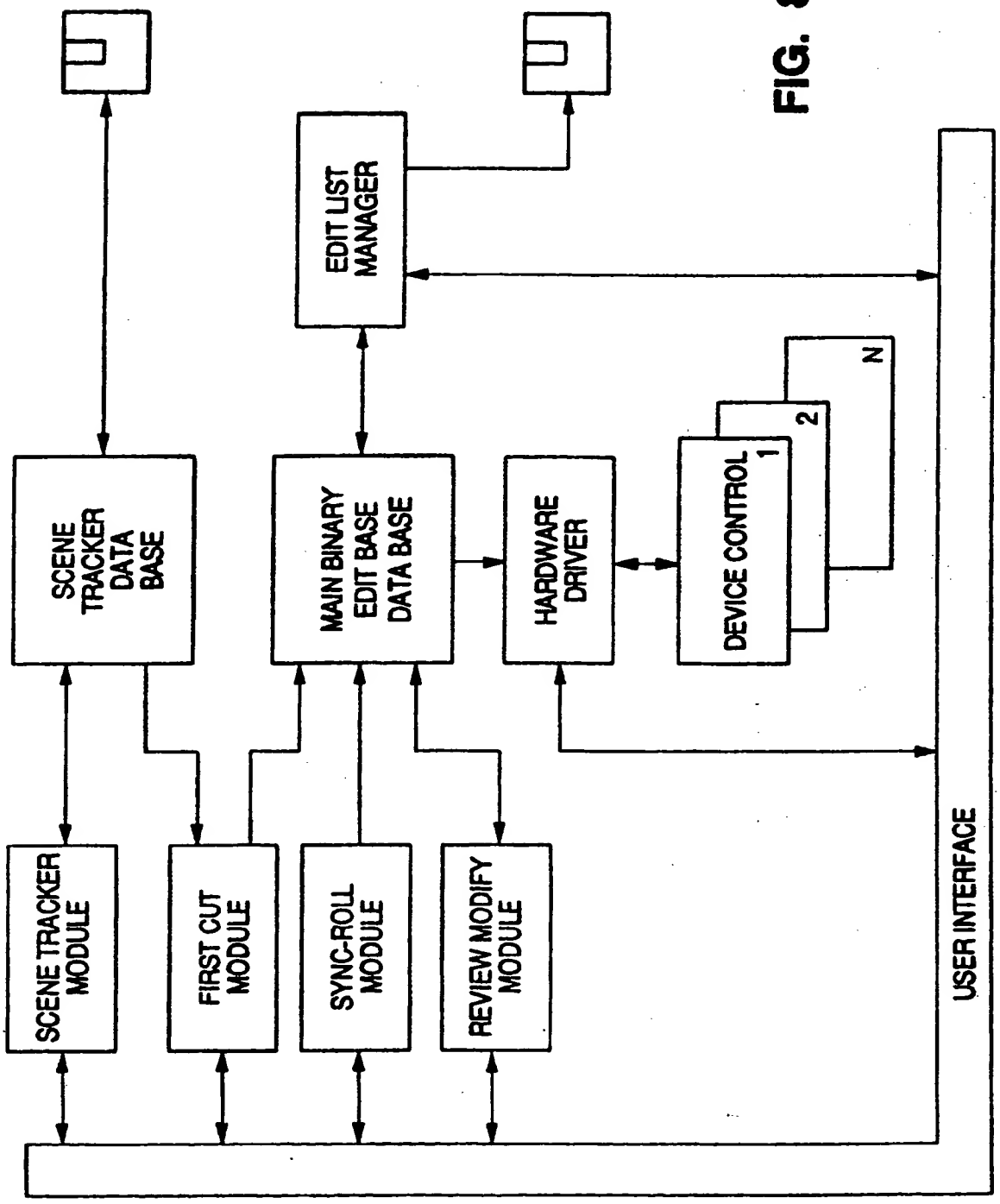


FIG. 8

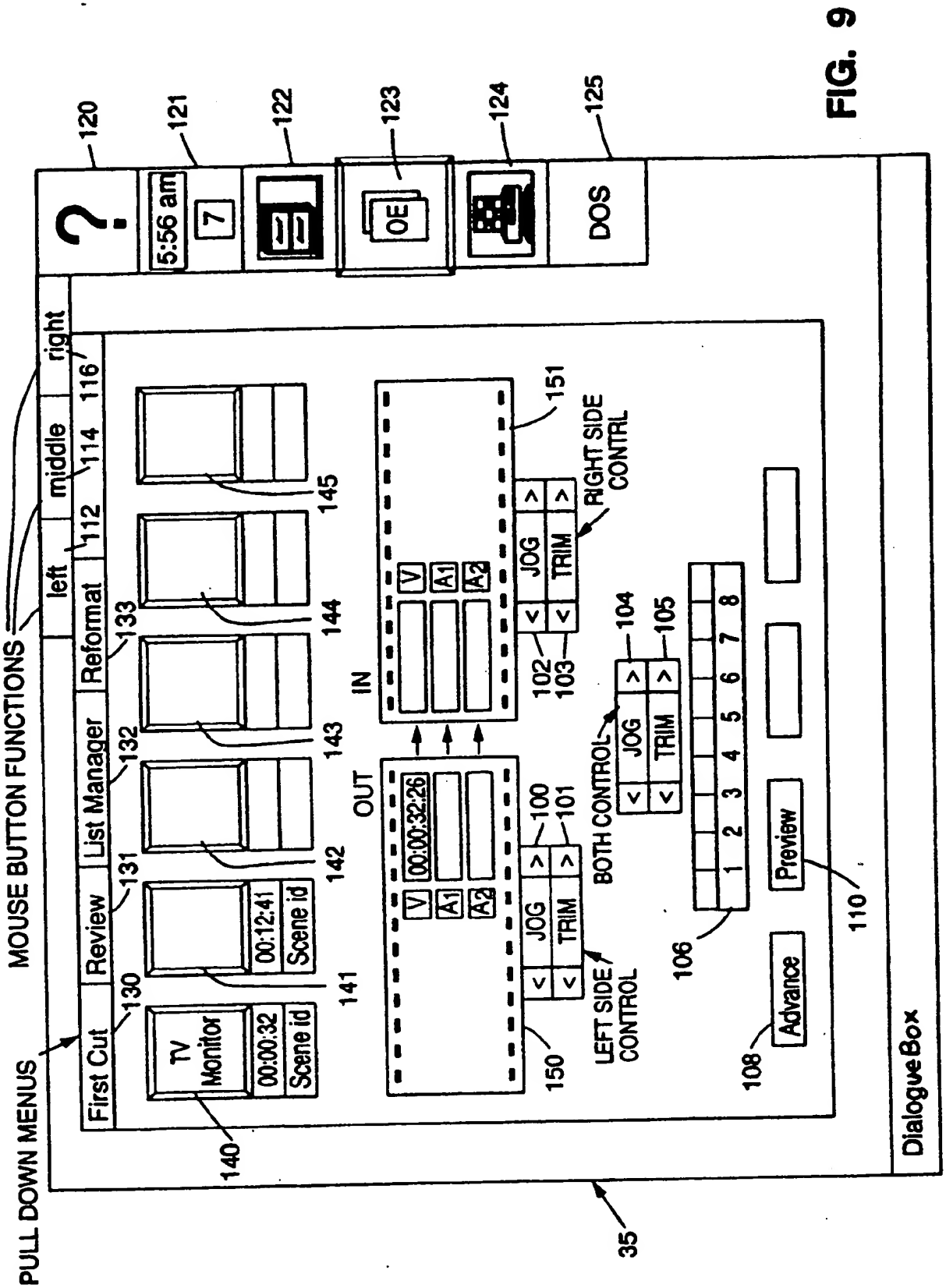
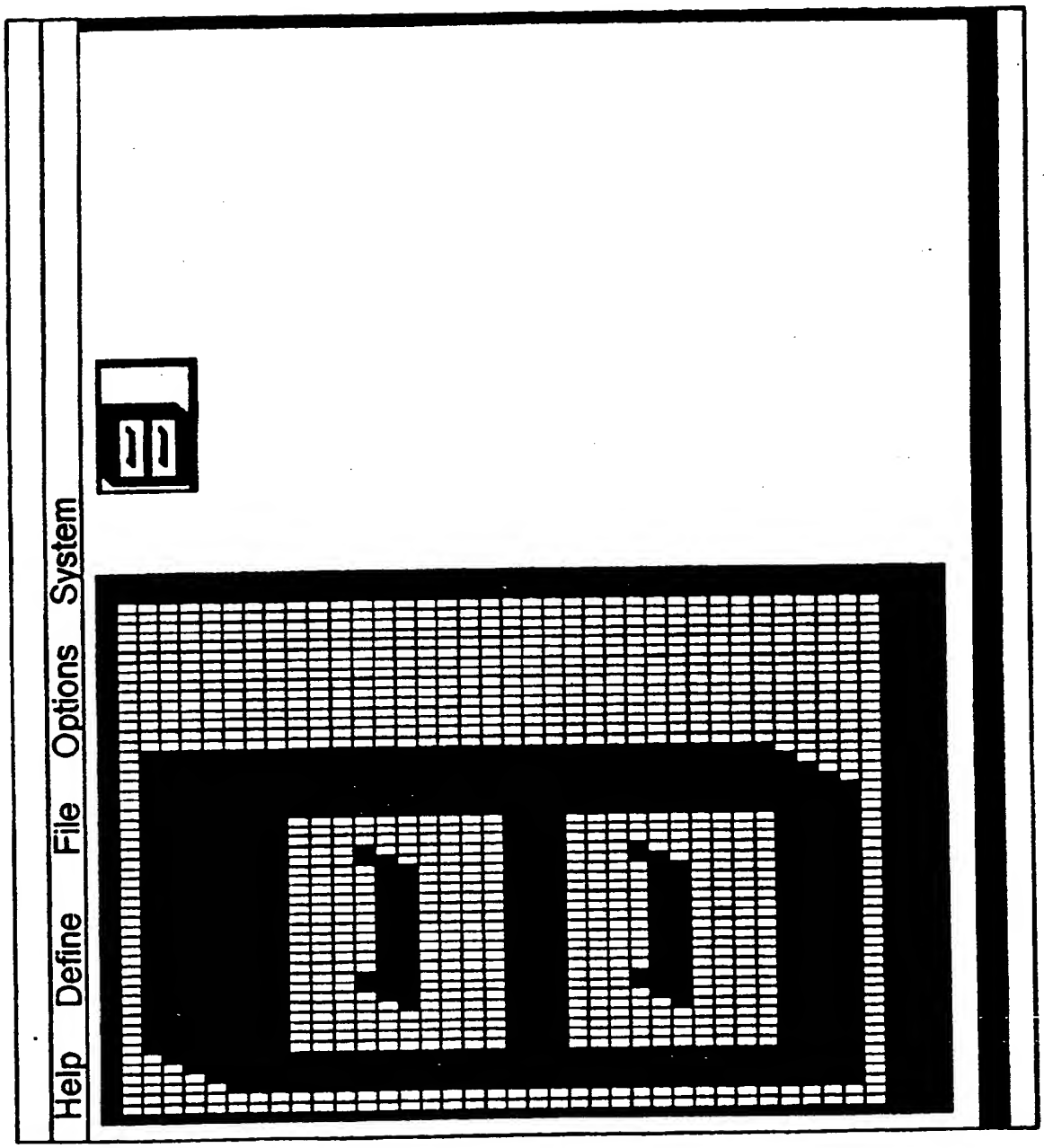


FIG. 9

FIG. 10



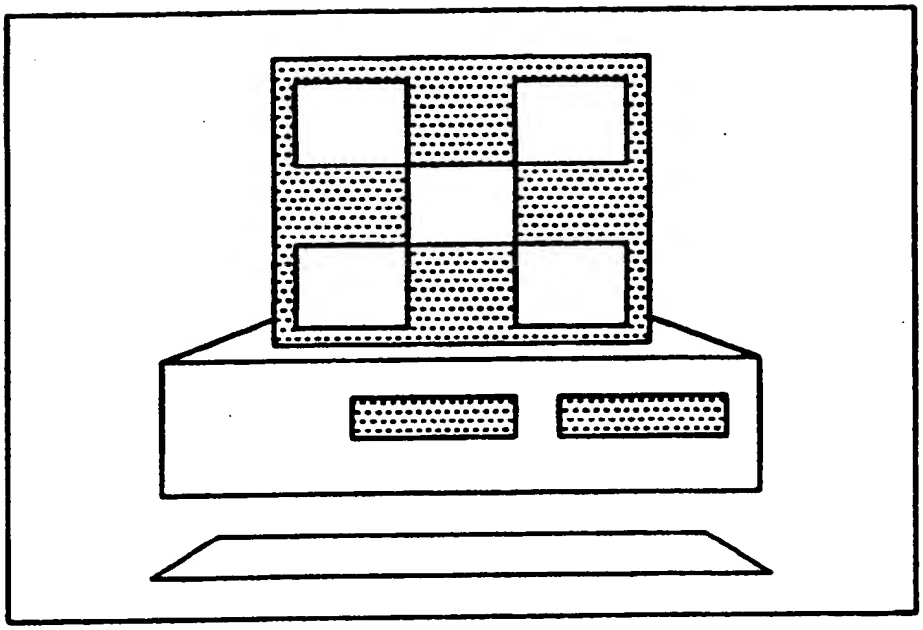


FIG. 11

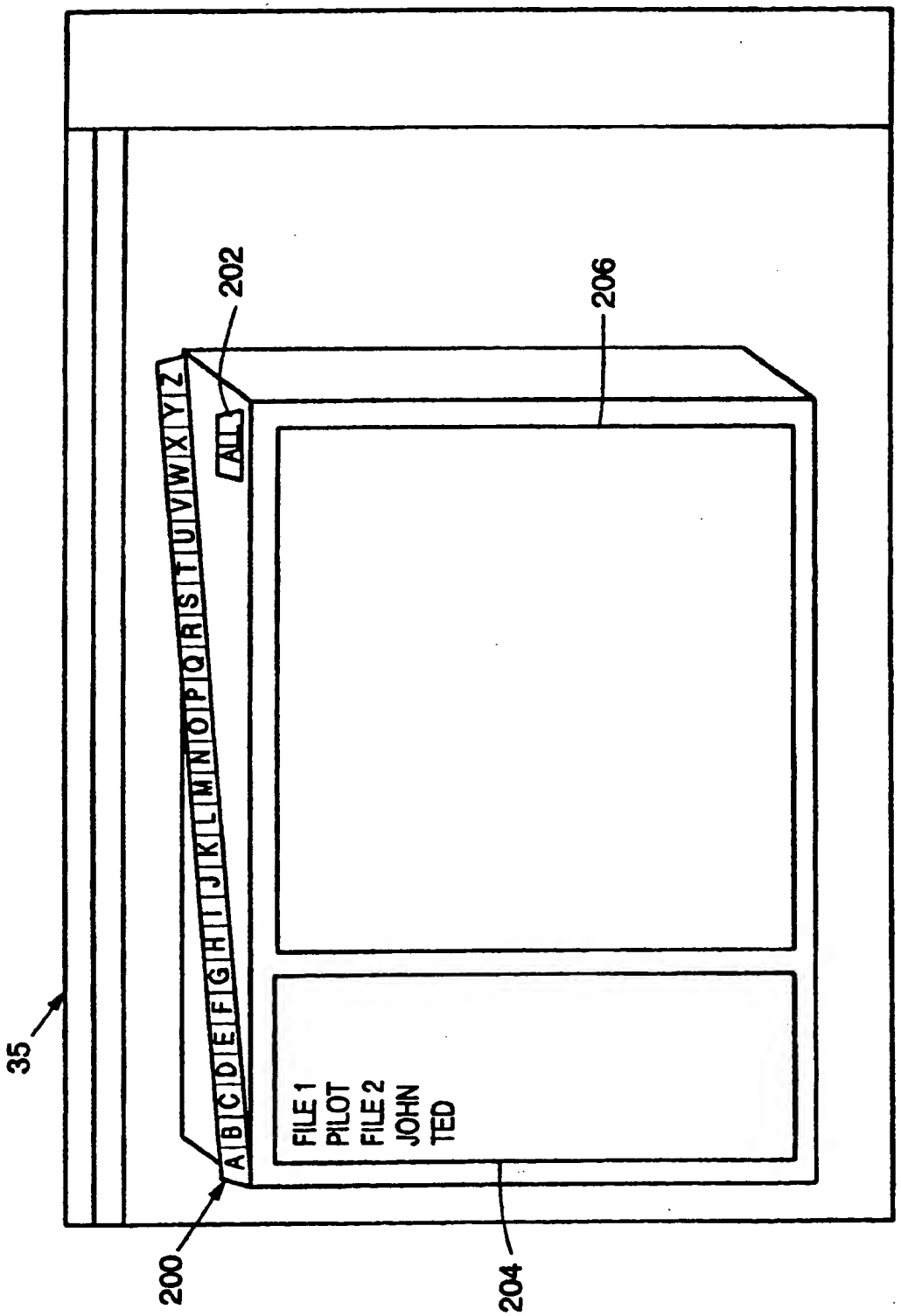


FIG. 12

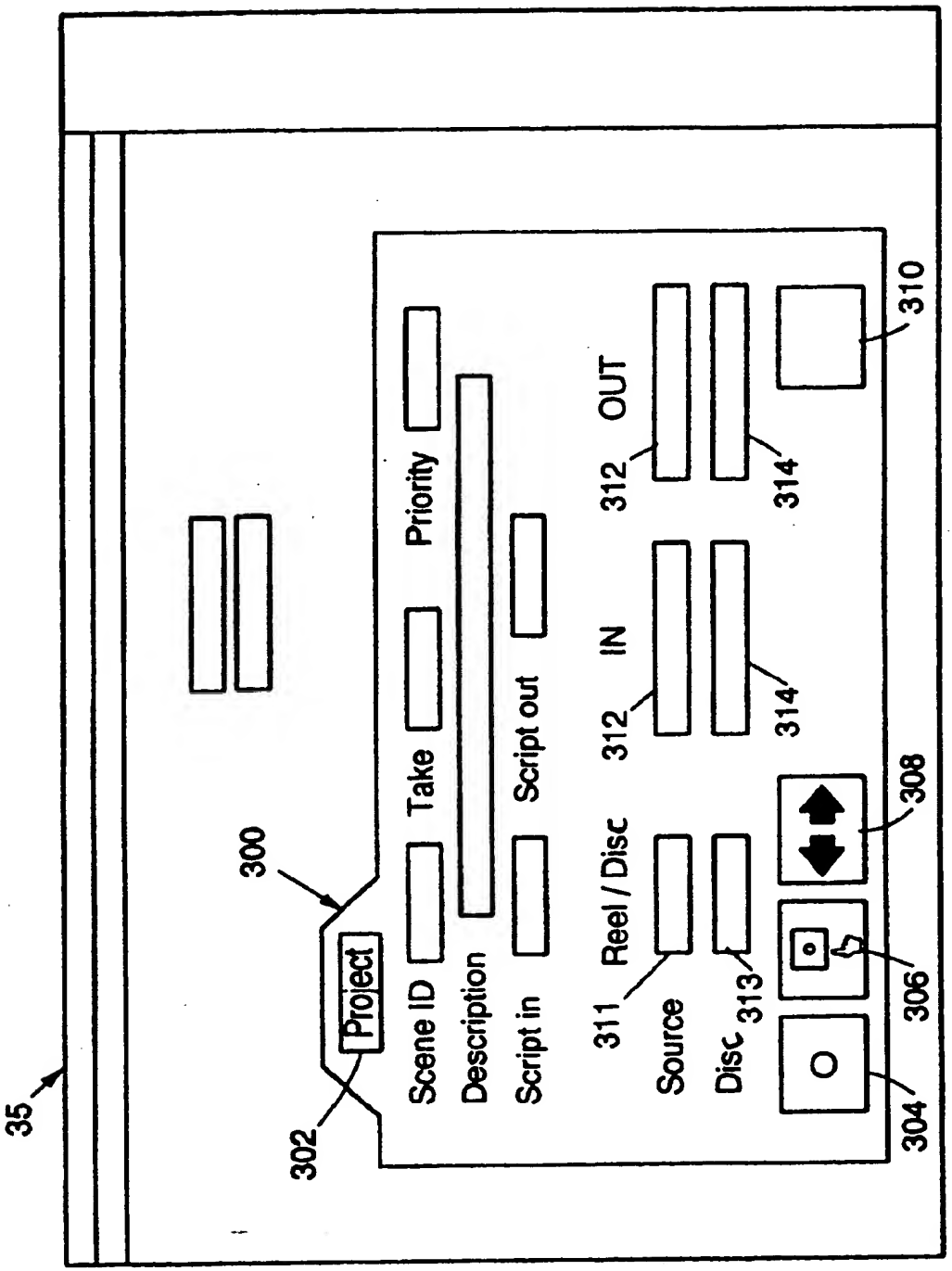


FIG. 13